



# Torsion and inflammation of Meckel's diverticulum: Rare cause of acute abdominal pain



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## ABSTRACT

Meckel's diverticulum is a remnant of the embryologic vitelline duct. It was named after its anatomical and embryological description, in the early 19th century, by Johann Meckel. It is known as a true diverticulum of the small bowel and is typically estimated to be present in 2% of the general population, with only a very small percentage being symptomatic. In this report, we present a 14-year-old boy with complaints of abdominal pain, fever, nausea, vomiting and diarrhea. During physical examination we observed peritoneal irritation and raised inflammatory markers. Surgical exploration revealed torsion and inflammation of a large Meckel's diverticulum with a gangrenous area. In order to ensure the removal of ectopic tissue, if present, segmental bowel resection with primary anastomosis was performed. Histopathological analysis did not find ectopic tissue. The operative and postoperative courses were uneventful. Meckel's diverticulum is an important differential diagnosis in acute abdominal pain in children.

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## 1. Introduction

Meckel's diverticulum is a remnant of the embryologic vitelline (omphalomesenteric) duct that connects the fetal gut with the yolk sac and normally involutes between the fifth and seventh weeks of gestation [1]. Wilhelm Fabricius Hildanus, a German surgeon, first described the diverticulum in 1598. However, the entity was not named until 1809, when Johann Friedrich Meckel first reported his research on the diverticulum's anatomy and embryology [1–3]. It is the most common congenital abnormality of the small bowel and consists of all normal layers of the bowel wall (true diverticulum). Traditionally, the rule of two describes its characteristics, such as a prevalence rate of 2% in the general population, a male-to-female ratio of 2:1, presence of symptoms before age 2 years, a location at a distance of 2 feet (60 cm) to the ileocecal valve in the anti-mesenteric side, a diverticular length of 2 inches (5 cm), and two types of common ectopic tissues (gastric and pancreatic) [2,4,5]. Moreover, only an estimated 4% of patients with Meckel's diverticulum will become symptomatic [1,2]. Clinical presentation varies considerably depending on the configuration of the remnant

structure and the presence of ectopic mucosa. In children, the three most common presentations are intestinal bleeding (30–56%), intestinal obstruction (14–42%) and diverticular inflammation (6–14%) [1,2,4,6,7]. In patients presenting with obstruction or inflammation, the diagnosis of Meckel diverticulum is not typically determined preoperatively as symptoms are nonspecific [5]. Moreover, accordingly to Park et al., younger patients (especially those younger than 4 years) tended to present with obstruction, whereas older patients tended to present with bleeding and the frequency of symptomatic Meckel diverticulum declines with age in the pediatric population. We present a case of a 14-year-old male with acute abdominal pain who presented Meckel's torsion and inflammation intraoperatively.

## 2. Case report

The patient was transferred to our hospital with suspected appendicitis. Clinical presentation consisted of abdominal pain over 72 h, initially periumbilical and later localized in right lower quadrant, low grade fever, nausea, vomiting and diarrhea. During physical examination, the patient was pale, febrile, tachycardic with generalized abdominal tenderness and peritoneal irritation. Laboratory studies showed severe leukocytosis ( $35 \times 10^9$  per L) with neutrophilia (84%) and elevated C-reactive protein (CRP) (30 mg per L). With this clinical picture, there was no need to

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undergo any preoperative imaging studies. An urgent exploratory laparotomy was performed, which revealed a bulky gangrenous Meckel's diverticulum with torsion of its pedicle, 50 cm distant to ileocecal valve (Figs. 1–3). A 10-cm-ileal-segment containing the diverticulum was resected and an end-to-end double-layer anastomosis was performed (Fig. 4), followed by an appendectomy. Intravenous antibiotics were started intraoperatively (cefuroxime, gentamicin and metronidazol). The operative and postoperative courses were uneventful. Oral feedings were started on day 5 postoperatively, with full oral intake 2 days later accompanied by normal bowel movements. The patient was discharged on day 7 postoperatively. The histopathological study described: torsion of a diverticular structure measuring  $12 \times 7$  cm, with transmural necrosis with no ectopic mucosa and a normal appendix. The patient was asymptomatic 3 months after surgery.

### 3. Discussion

Meckel's diverticulum is one of the most common congenital anomalies of the gastrointestinal tract, despite the fact that it is only symptomatic in a small percentage of cases (4–6% according with literature) [1,2,8,9]. It also represents a diagnostic problem since this pathology tends to mimic many other abdominal pathologies, such as appendicitis. Generally, the presence of ectopic tissue explains the various pathological manifestations.

According to clinical features, patients with symptomatic Meckel's diverticulum may be categorized into four groups [4]: (1) intussusception; (2) non-intussusception bowel obstruction; (3) gastrointestinal bleeding; or (4) diverticulitis and/or perforation.

As previously mentioned, episodic painless hematochezia is the most common presentation of Meckel's diverticulum, which accounts for almost half of all lower gastrointestinal bleeding in children. Bleeding is generally attributed to the presence of ectopic mucosa, as gastric mucosa is present up to 80% of the cases. Meckel's scan using technetium-99m pertechnetate radionuclide study, which binds to gastric mucosa, may offer a preoperative diagnosis in these cases. Additionally, intestinal obstruction, the second most common presentation of Meckel's diverticulum, may be caused by a mechanism of intussusception (the diverticulum acts as a leading point, causing ileocolic intussusception) or volvulus, but also as an internal hernia or as an incarcerated inguinal hernia (Littre). Preoperative ultrasound confirms diagnosis of intussusception but does not identify a pathologic lead point and, in some cases, might suggest the presence of internal and Littre hernia. Inflammation of the diverticulum is also often attributed to the presence of ectopic mucosa (gastric or pancreatic) but



Fig. 2. Meckel's Diverticulum after detorsion.

obstruction of the diverticular lumen can also produce inflammation, similar to the mechanism observed in appendicitis. In this situation, a preoperative ultrasound or computed tomography scan might find a midline mass with a normal appendix.

In this report, we present a rare of Meckel's diverticulum with both torsion and inflammation with no ectopic mucosa. Surgical exploration was promptly performed as the patient presented with deteriorating vital signs and peritoneal irritation. Moreover, considering the gangrenous area, it is very likely that surgery was done just before perforation, avoiding peritonitis. The treatment for a symptomatic Meckel's diverticulum consists of resection using either an open or laparoscopic approach. In this case, we opted for open approach based on surgeon's preference [1,4].

Resection may be accomplished by either simple diverticulectomy or segmental ileal resection with anastomosis. In cases of bleeding, an ulcer may be present at the base of the diverticulum or on the mesenteric side of the ileum. Therefore, segmental resection



Fig. 1. Torsion of Meckel's Diverticulum.

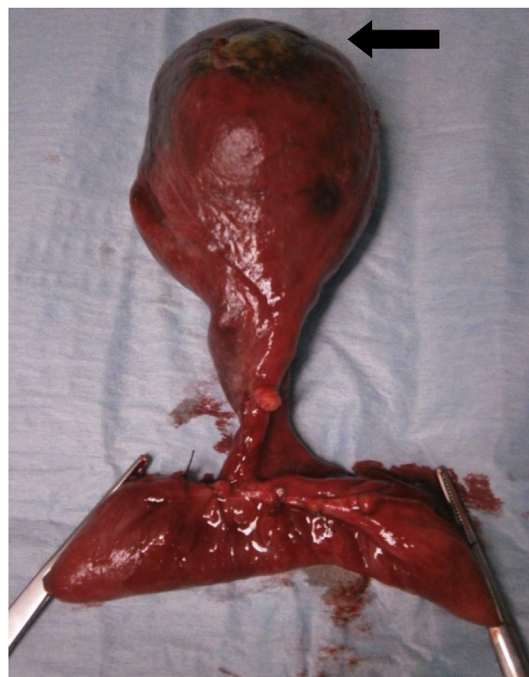


Fig. 3. Intestinal resection containing Meckel's Diverticulum, with gangrenous area (black arrow).



**Fig. 4.** Intestinal anastomosis.

is typically regarded as the safest approach to ensure removal of the bleeding source avoiding risk of recurrent bleeding. In patients with obstruction, simple diverticulectomy may be sufficient, but all ectopic tissue should be removed. If the diverticulum is found after reduction of an intussusception, diverticulectomy may be possible but segmental ileal resection may be safer depending on the appearance of the bowel (narrow or wide base, for example) [1,4].

Park et al. recommend that if a palpable mass is identified at the base of a Meckel's diverticulum, the resection margin must be free through the entire mass. In the cases who present with no palpable mass, a simple diverticulectomy is sufficient.

In this case, segmental bowel resection was carried out, opposed

to simple diverticulectomy, to ensure removal of all ectopic tissue (in case any was present) [1,4].

#### 4. Conclusion

Meckel's diverticulum, although rare, is an important differential diagnosis in acute abdominal pain in pediatric age and it requires a high index of suspicion.

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